Study of Regional Climate Changes

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The SUNYA project consists of three tasks: (1) analysis of model intercomparison results at the regional scale, (2) regional climate model (RCM) development and application, and (3) Climate Variability Analysis. In Task 1, the simulations in the AMIP-CMIP databases were examined to determine their ability to accurately reproduce features of the East Asian and Northeastern United States climates. Task 2 uses the SUNYA RCM to study the sensitivity of regional climate to cloud-radiation interactions, and air-sea interactions. In Task 3, collaborations with scientists from the Institute of Geography, Chinese Academy of Sciences, will systematically analyze the long-term climate database developed in previous years to document climate variability in Eastern China during the past 1,000 years.

In the presentation, recent results in studying subgrid-scale aspects of cloud-radiation interaction in SUNYA-RCM will be highlighted. Specifically, we have coupled the prognostic cloud water content based on the explicit microphysical scheme with the radiation calculation. The treatment will allow the feedback of changes in climate to cloud radiative property with subsequent effect on the longwave and shortwave radiative heating/cooling. For 1991 and 1998, when severe floods occurred in the Yangtze-Huai River valley over Eastern China, the RCM reproduces reasonably well the daily variations of precipitation, surface air temperatures, and total cloud amount. Discussions on the differences in the simulations between the prognostic and diagnostic (used in previous studies) cloud liquid water will also be presented.

Refereed Publications (since 2000)

Gong, W. and W.-C. Wang, 2000: A regional model simulation of the 1991 severe precipitation event over the Yangtze-Huai river valley. Part II: Model bias. J. Climate, 13, 93-108.

Liang, X.-Z., W.-C. Wang, and A. N. Samel, 2001: Biases in AMIP simulations of the East China monsoon system. Clim. Dyn., 17, 291-304.

Liang, X.-Z., A. N. Samel, and W.-C. Wang, 2001: China rainfall interannual predictability: Dependence on the annual cycle and surface anomalies. Submitted to J. Climate, August 7, 2001.

Riches, M. R., W.-C. Wang, P.-Q. Chen, S.-Y. Tao, S.-G. Zhou, and Y.-H. Ding, 2000: Recent Progress in The Joint Agreements on "Global and Regional Climate Change" Studies between the United States and the People's Republic of China. Bull. Am. Meteo. Soc., 81, 491-500.

Wang, W.-C., W. Gong, and H. Wei, 2000: A regional model simulation of the 1991 severe precipitation event over the Yangtze-Huai river valley. Part I: Precipitation and circulation statistics. J. Climate, 13, 74-92.